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FRIDAY, AUGUST 9, 1895.

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SAPORTA AND WILLIAMSON AND THEIR WORK IN PALEOBOTANY.

THE science of fossil plants has lost within a period of less than six months two of its oldest and most eminent cultivators, the Marquis Gaston de Saporta and Professor William C. Williamson, the former of whom died on the 26th of January, at the age of seventy-two years, and the latter on the 23d of June, at the age of seventy-eight years. The immense loss which science has sustained in the death of these two men is only partially lessened by the fact that they were not cut off, as are so many men of promise, in the prime of life, but were spared to continue to a ripe age their valuable labors. The monument that each has erected for himself is greater and more enduring than any that others can ever erect for them.

Having been in direct communication with both of them for a full decade and having been also, to a limited extent, personally acquainted with them, I have felt it a duty to science, and especially to that branch of science which I have cultivated most, to speak a word from this side of the Atlantic in recognition of their services.

THE MARQUIS SAPORTA.

IN a paper in which I contributed in 1885 to the Fifth Annual Report of the U. S. Geological Survey (p. 383), and in which I gave brief sketches of the principal workers in paleobotany, I attempted to review Saporta's work, as then known to me, from an acquaintanee with his scientific contributions. This sketch was exceedingly defective and did poor justice to his merits, but was the best I was able to make at that date. Aside from the grave omissions there made, it must be said that his labors were

far from being completed, and in the last ten years of his life he produced many of his most important works. It is not always safe to judge an author by the number of titles that his bibliography contains, but for an author all of whose contributions are certain to be of value to science this criterion has considerable weight. I have been able to collect together about 150 titles of Saporta's works, several of which are volumes elaborately illustrated, and two of which consist of long series of exhaustive and painstaking papers.

I shall attempt here to mention only a few of the leading subjects to which the Marquis Saporta devoted his energies. He was born at St. Zacharie, Department of Var, in the South of France, on the 28th of July, 1823, and christened Louis Charles Joseph Gaston. As his name indicates, he was of Spanish descent and belonged to one of the oldest families of the nobility of that country that are so frequently met with in this part of France. We are informed by his illustrious coworker, M. R. Zeiller,* that he was in more or less direct communication during his boyhood with the eminent entomologist, Boyer de Fonscolombe, his maternal grandfather, and that his own father also cultivated entomology to some extent. This may have tended to inspire in him a taste at least for scientific study. But this atavistic taste did not develop in early life, and prior to the age of 30 he devoted himself chiefly to literature and history. At about that time he was accidentally brought into relations with the founder of paleobotany, M. Adolphe Brongniart, who had been interested in certain fossil plants from Tertiary beds near Saporta's home at Aix and from Manosque. This appears to have given the special bent to his mind which determined the labor of the rest of his life, and thenceforward to the time of his death he devoted himself unceasingly to the study of fossil plants, and largely to those rich fossil floras which he has made known in Provence. A letter which he wrote to M. Charles Th. Gaudin, and which the latter published in the 6th volume of the 'Bulletin de la société Vaudoise des sciences naturelles' for April 18, 1860, shows clearly that he had already at that date been a long time engaged in the collection and study of the fossil plants of Provence, but this seems to have been his earliest contribution on the subject of fossil plants. These already rather full notes were greatly expanded and published the following year in Gaudin's translation of Heer's Researches on the 'Climate and Vegetation of the Tertiary,' which forms a part of the 3d volume of Heer's 'Tertiary Flora of Switzerland,' the French translation being published separately.*

These papers were merely preliminary to the extensive series which began to appear the next year, viz., his 'Études sur la végétation du sud-est de la France á l'époque tertiaire.' This series was published in the 'Annales des sciences naturelles, botanique,' beginning with the 16th volume of the 4th series, 1862, and concluding with the 9th volume of the 5th series, 1868, and embracing 13 distinct papers, all profusely illustrated by beautifully prepared lithographic plates. Four years later he made a complete revision of this work in three similar papers which appeared in the 15th, 17th and 18th volumes of the same serial, 1872–1873. In 1888 he returned to this subject and published his 'Dernières adjonctions' in two papers in the 7th and 10th volumes of the 7th series of the same work. In this exhaustive treatise the Tertiary flora of the

* Revue générale des science, 15 avril, Paris, 1895, p. 359.

* Recherches sur le climat et la végétation du pays tertiaire, par Oswald Heer, traduction de Charles Th. Gaudin, Winterthur, 1861. B. Examen des flores tertiares de Provence par M. Gaston de Saporta, pp. 133–171.

South of France has been made as well known to science as is its living flora.

While in the midst of the studies of the Tertiary flora of southern France he undertook another even more ambitious work, being nothing less than a complete monograph of the Jurassic Flora of France to be published in the great paleontological serial, the 'Paléontologie Française.' This monumental work was issued in fascicles to the number of forty-seven, beginning in January, 1872, and ending in July, 1891. It was finally published in four large volumes, with an aggregate of over 2000 pages and 300 plates, royal octavo. It is a complete systematic treatise on the entire Jurassic Flora of France, from the Infralias or Rhetic to the Purbeck, and like all Saporta's works, which differ in this respect from those of most paleobotanical authors, it is founded upon a most careful study of the living vegetation of the globe.

It seems almost incredible that in the midst of these great labors Saporta should have found time for anything else beyond a few minor contributions; but not only was the number of these latter large and their magnitude often considerable, but several of them rise to the dignity of important works. Among such are to be mentioned his classical memoir on the Fossil Flora of Sézanne,* at the extreme base of the Tertiary; the still more extended monograph of the 'Pliocene Flora of Meximieux, Department of Ain,' in which, however, Professor A. F. Marion, of the University of Montpelier, was associated with him; † a fine essay on the 'Flora of Gelinden' * in Belgium, a formation in the extreme Upper Cretaceous, which appeared in 1873, with a revision of the same † in 1878, in both of which, as in the one last mentioned, Professor Marion assisted him; the handsome volume which he published in 1879, entitled 'Le monde des plantes avant l'apparition de l'homme,' which is a popular account of the whole subject of fossil plants written in a lucid and fascinating style, and which is to-day the best popular work on the subject and was translated into German by Carl Vogt in 1881; a still larger work somewhat in the same line but much less popular, and in the preparation of which Professor Marion was again associated with him, viz., 'L'Évolution du régne végétal,' published in three volumes as one of the International Scientific Series, no English translation of which has appeared. The first volume of this work, published in 1881, relates to the Cryptogams, and the second and third, which appeared in 1883 and 1885, respectively, to the Phanerogams. This is the most successful attempt thus far made to trace the development of plants from its earliest beginnings to its latest forms by the aid of paleontology, and if it be true, as is generally admitted, that complete success in this attempt was not attained, it will nevertheless form the basis for all future researches in this line.

Another and very different task was undertaken when in 1882 he essayed to reply to the strictures of Dr. A. G. Nathorst on the nature of the supposed fossil algæ of the earliest rocks. To this controversy he has contributed two elaborate treatises, the

* Prodrome d'une flore fossile des Travertins anciens de Sézanne. Mém. Soc. Géol. de France, 2e Sér., Vol. VIII., Paris, 1868, pp. 287–438, pl. xxii.–xxxvi.

† Recherches sur les végétaux fossiles de Meximieux, par le Comte G. de Saporta et M. le Dr. A. F. Marion; précédées d'une introduction stratigraphique par M. Albert Falsan. Archives du Muséum d'Histoire naturelle de Lyon, Vol. I., Lyon, 1876, pp. 131–335, pl. xxi–xxxviii.

* Essai sur l'état de la végétation à l'époque des marnes heersiennes de Gelinden, par le Comte G. de Saporta et le docteur A. F. Marion. Mém. Cour. Acad. roy. Belgique, Vol. XXXVII., No. 6, Bruxelles, 1873.

† Révision de la flore heersienne de Gelinden, par le le Comte G. de Saporta et le Dr. A. F. Marion. Op. cit., Vol. XLI., No. 3, Bruxelles, 1878.

first entitled: 'A propos des algues fossiles,' which appeared in 1882 in the form of an illustrated folio volume of 82 pages and 9 plates; and the second entitled: 'Les organismes problématiques des anciennes mers,' which is a slightly larger companion volume of 102 pages and 12 plates. This is not the place to discuss the question involved in these works, but no one denies that the Marquis Saporta has here brought forward the strongest evidence that the case will permit for the existence of vegetable remains at these remote periods.

A second popular and very useful work was his 'Origine paléontologique des arbres cultivés ou utilisés par l'homme,' a small octavo volume of 360 pages and numerous woodcuts, which appeared in 1888. This work evinces a wide acquaintance with the dendrology, not only of Europe but of the world, and is based mainly upon the author's profound knowledge of the Later Pliocene and Quaternary floras of France.

Without stopping to mention other works which have almost as much claim as the ones already treated, I will indulge in a final word relative to the work upon which our author was engaged at the time of his death. I allude to his studies in the Lower Cretaceous flora of Portugal. After the death of Oswald Heer, to whom the collections made by the Geological Survey of Portugal from the plant bearing Mesozoic beds of that country had been sent, and who had published one important contribution to the subject, these collections were sent to Saporta, and he had been engaged upon them, as time would permit, since 1886. In 1888 he published, in the 'Comptes Rendus,' a preliminary account of their nature, in which it appeared that there were now being found in the Portuguese beds below the Cenomanian certain dicotyledonous forms which greatly interested the Marquis, since this was by far the earliest appearance in Europe of that type of plant life; although, as was well known to him, we have, in our Potomac flora of Virginia, deposits of still greater age containing such plants. The appearance of this and a still later similar paper on the same subject but without illustrations, taken in connection with the fact that I was at the time actively engaged in the study of the equivalent beds of this country, led to an interesting correspondence, which was kept up until the summer of 1894, when it was my good fortune to pay a visit to the veteran paleontologist at Aix for the purpose of examining the material in his hands with a view to a comparison of the Portuguese forms with those of the United States. My brief sojourn at Aix and at Fonscolombe, as the guest of the Marquis, afforded me the valued opportunity to add to my knowledge of him as a scientific man and a genial correspondent, a glimpse of his personal character, and to learn that along with those sterling attributes which are required to make a man of science there went the generous hospitality, the unaffected simplicity and the cordial affability that characterize the true nobleman. My reception on that occasion at the Château of Fonscolombe, his country residence, where I made the acquaintance of his interesting family, was of the warmest character; and my brief stay there was in the highest degree enjoyable.

I found that the first instalment of his work on the Portuguese Flora was almost ready to appear, but the material that had reached him since this volume went to press was considerable, and this I was also permitted to see. I need not here repeat the account which I have already given in these columns* of the scientific value of this visit and the general nature of the work under consideration. He promised to send me the new volume, together with a number of other works of his which I informed him I had

*Science, New Ser., Vol. 1, March 29, 1895, pp. 337–346.

not yet received, but they never came, as the hand that was to direct them was soon stricken and compelled to lay down the pen that had written so many volumes and the pencil that had done more than any other to embellish the science of fossil plants.

His last undertaking seems to have been a work on the fossil Nympheaceæ and two preliminary papers had already appeared in the 'Comptes Rendus.' He showed me a wonderful series of specimens and the inimitable drawings of them that he was making.

The question naturally arises: Upon whom is the mantle of this eminent investigator destined to fall? In addition to a large amount of posthumous work that is known to exist, much of which is probably nearly ready for publication, there are the large collections which have been sent to him from many sources and which are greatly in need of elaboration.

He left a large family, children and grandchildren, and at least two of his sons have grown to manhood, the eldest, Count Saporta, whose acquaintance I made, as well as that of the Countess, was the private secretary to the Comte de Paris, and even while I was there he had received a dispatch announcing that the Comte was dying at his place of exile in England, whither he had to repair immediately, and we traveled together to Marseilles. Another married son, the Viscount Antoine de Saporta, has made at least one important contribution to fossil plants, viz., a review of Nathorst's 'Fossil Flora of Japan,'* based on the original Swedish text before the appearance of the authorized French translation, which was regarded of sufficient moment to call forth a reply from the author†. He may have written still other papers which have not come to my notice. Whether this young man is to follow in the footsteps of his father remains to be seen.

There are two features of Saporta's work which have not been mentioned, viz., attention to bibliographical matters and a tendency to philosophize. For the past ten years Saporta had been contributing most valuable summaries in the entire domain of vegetable paleontology, which were published in the 'Revue générale de botanique,' under the direction of M. Bonnier. Many of these amount to original contributions and include the description and illustration of new forms.

With regard to his philosophical tendencies it should be said that he allowed the logic of facts to influence his thoughts, and was, from the outset, a consistent exponent of the general doctrine of evolution and the special doctrine of plant development. In addition to the works above referred to, which directly bear upon this subject, and to the general treatment of it in his popular works, he has contributed quite a number of articles to the popular magazines, especially to the 'Revue des Deux Mondes,' which have afforded him an opportunity to strike out the broad outlines of a general philosophy. One of the most original of his rational conclusions, and one that is fully sustained by the facts, but almost completely ignored by all other writers, is that the most important subdivisions of the geological scale must be drawn at different points for plant development from those at which they are commonly drawn for animal development. For example, the Mesophytic age properly ends with the Jurassic instead of with the Cretaceous, while the Tertiary for fossil plants closes with the Miocene instead of with the Pliocene.

* Ann. de Sci. Nat., Bot., 6th Ser., Vol. XV., 1883, pp. 149–167.

† Loc. cit., pp. 337–341.

PROF. W. C. WILLIAMSON.

IN my series of sketches of the leading paleobotanists,* referred to above, still

* Fifth Annual Rept. U. S. Geol. Surv., 1885, p. 376.

greater injustice was done to Prof. Williamson than to Saporta. I was acquainted with his work at that time only from the great series of memoirs which he was publishing in the Philosophical Transactions, and which I was only able to consult in the ponderous volumes of that serial. I therefore limited myself almost exclusively to a mention of that work, 12 numbers of which had then appeared. The earliest paper relating to fossil plants with which I was then acquainted was dated 1842, and I therefore provisionally gave this date as the beginning of his work on fossil plants. I soon after collected titles, some of which go back to 1836,* but in a letter from him dated June 16th, 1886, thanking me for this poor mention of his name, he said: "Your only mistake is in starting me on my paleobotanical career in 1842, since I am the same W. C. Williamson, Jun., whose name you will find so frequently in the Fossil Flora of Lindley and Hutton. You will see that my labors began in 1833, so that I have now been in the field 56 years—a regular old stager." I was indeed aware that a 'Mr. William Williamson, Jun.,' had contributed to Lindley and Hutton's Fossil Flora a large number of notes and sketches, all of which had been used by those authors and gratefully acknowledged, and I suspected that this might have been the same Professor Williamson, but as these notes all referred to impressions of plants from the Oölite of Yorkshire, while his chief labors had been on the internal structure of Carboniferous plants, it was natural that I should doubt their identity. I am now happy to be able to correct his correction and show that his absolutely first contribution to that work was made in 1832 instead of 1833.†

*See the Proc. Geol. Soc., London, for Nov. 16, 1836, Vol. II., p. 429.

† The Fossil Flora of Great Britain by John Lindley and William Hutton, Vol. I., London, 1831–1833 (the first fascicle, pp. 1–48, pl. i.–xiv., was issued in 1841 and the second, pp. 49–166, pl. xv.–lix., in 1832. His first sketch, which was that of *Cyclopteris Beanii*, constitutes pl. xliv., and is described on pp. 127–129. It was found by his father, but a note signed by 'W. Williamson, Jun.,' on p. 127, shows that he had much to do with it, and although it is not stated that the sketch was made by him, there is every probability that it was. An examination of the entire work shows that he contributed no less than 30 of the species described in it, constituting nearly all from the Oölite of Yorkshire, and that in every case he not only furnished the specimen but an accurate drawing which the authors always used).

The same year in which I received the above mentioned letter there occurred a transaction, which, though trifling in itself, serves in an admirable way to illustrate Professor Williamson's personal character. Being very desirous to obtain the reprints of his memoirs 'On the Organization of the Fossil Plants of the Coal Measure,' from the Philosophical Transactions, as well as many other works relating to fossil plants, I had prepared an extensive list of such works, including this one, from a catalogue of Dulau & Co., Soho Square, London, and requested the Geological Survey to purchase the books. The invoice arrived substantially complete with the exception of Professor Williamson's work. Much time elapsed and the work did not come, further correspondence showing that it had not been possible to obtain it. I therefore wrote direct to Professor Williamson, begging him if possible to spare a set to Messrs. Dulau & Co., for our use in America. The very next steamer brought the full set direct to me without cost and another characteristic letter, from which I make the following extract:

"Your letter of October 28th has thrown light upon what appeared to me a queer affair. I received an application from Messrs. Dulau for a set of my memoirs; I replied that I had only three spare copies left, that I never had sold a copy and that I much preferred not doing so, since I had rather reserve them and give them to some

paleontologists that I knew would make good use of them. * * *

"I am so glad that you have written direct to me about the affair, because yours is precisely the sort of case that I contemplated in my letter to Dulau & Co. I will send the set of 12 memoirs to you and beg that you will accept them from me."

William Crawford Williamson was born November 24th, 1816, at Scarborough, in Yorkshire. We are fortunate in having a most admirable sketch of his life by Mr. Charles Bailey, F. L. S., published in the Manchester Scientific Student's Annual Report for 1886, which sets forth the principal facts in connection with his early life and also contains, as a frontispiece, an excellent portrait of him at that date. In this paper Mr. Bailey says:

"Circumstances had made Professor Williamson's father a gardener by profession, but nature had made him a geologist, and placed him in one of her most valuable domains, viz., on the Oölitic and Cretaceous rocks of Yorkshire. The late Professor Phillips tells us in the preface to the third edition of his classical work, *Illustrations of the Geology of Yorkshire*, how he had, in company with his uncle, William Smith, 'the Father of English Geology,' gathered fossils beneath the romantic cliffs of Whitby and Scarborough, but that in 1824 he had the good fortune to become acquainted with two of the most valuable of all his early friends, Mr. William Bean and Mr. John Williamson (the father of the future professor), and to profit by their admirable collections of recent and fossil shells, crustacea, echinida and corals, dredged from the neighboring sea, or hammered out of the adjacent rocks. The father naturally trained his son William to pursue studies which were so fascinating to himself, and, in consequence, the father and the son became inseparable companions."

But the Williamsons were not people of great means, and the young scientist had to be apprenticed to a surgeon in Scarborough, where he remained from 1832 to 1835. It was during this period that he furnished the data above mentioned, to Lindley and Hutton's Fossil Flora, but he also published over his own name a number of papers on various other subjects, which displayed a wide knowledge of nearly every branch of natural history. These contributions gained for him the curatorship of the Natural History Society of Manchester, where he remained the next three years. He studied medicine and surgery, and in 1840 became a member of the College of Surgeons, and held several important positions, including that of Active Surgeon to the Chorlton-upon-Medlock Dispensary. In 1851 he became Professor of Natural History and Geology at Owens College, Manchester, and from that time until 1892 he followed the fortunes of this noted institution. Then, at the age of 76, he retired from professional labors in order to give himself up exclusively to his great work on fossil plants.

Professor Williamson's labors were by no means confined to vegetable paleontology, and his contributions to other branches of natural history are only less celebrated than those in this field. Mr. Bailey has passed these labors in review in a very satisfactory manner, and I must refer the reader to this sketch for an account of them, confining myself to the only subject on which I am at all capable of expressing an opinion. In 1842 he wrote upon the 'Origin of Coal,'* and in 1854, he returned to the study of the cycadean plant, *Zamia gigas*,† of which he had furnished the sketch for Lindley and Hutton,‡ and upon which

* Brit. Ass. Rept., 1842, Pt. 2, p. 48.

† For such he still modestly called it, although in the paper that immediately follows his in the Trans. Linn. Soc., Mr. William Carruthers renames this plant Williamsonia, thus founding one of the best marked genera of fossil plants.

‡ Foss. Fl., Vol. III., p. 45, pl. clxv.

he finally published an elaborate memoir in 1870.* This was his principal contribution to the external parts of fossil plants. Being an adept at the microscope he turned his attention to their internal structure, and found this study so fascinating and so profitable as to allow it to engross almost his entire energies from about the year 1869 to the end of his life.

An important paper appeared in 1869 on the 'Structure and Affinities of Some Exogenous Stems from the Coal Measures,'† and in quick succession during the same and the following years a number of papers describing his studies on the genus Calamites.‡ These papers constituted the natural prelude to his great series on the 'Organization of the Fossil Plants of the Coal Measures,' the first of which related to the genus Calamites and appeared in 1871.§ From this date these memoirs continued to appear in the Philosophical Transactions at the rate of a little more than one each year, so that the last memoir, of which he was the sole author, is No. 19, and is to be found in the 184th volume, published in 1893.

After his removal to London, in 1892, he associated with him the accomplished structural botanist, Dr. D. H. Scott, Honorary Keeper of the Jodrell Laboratory at Kew, and they worked together in the preparation of an additional memoir, which was laid before the Society on December 30, 1893, and an abstract of which appeared in the Proceedings of the Royal Society, Vol. LV., 1894, without illustrations. This memoir relates to Calamites, Calamostachys and Sphenophyllum. At the Oxford Meeting of the British Association Dr. Scott laid before the Botanical Section the principal results of this investigation, accompanied by profuse illustrations projected on the screen. As I had read the abstract before leaving America, I was naturally deeply interested in this paper, which it was my good fortune to hear. I had written to Professor Williamson that I intended to attend the British Association, and had received a reply in which he stated that he would not be present and begged me to visit him at his country cottage in Sussex, which, to my great regret, I was unable to do. But at Oxford I received another letter from him, renewing his invitation and alluding in no uncertain terms to certain tendencies in modern science which he had always deplored. This part of his letter contains so clear an expression of his views on this question, which he had never published, that I cannot do better than to quote it here.

"I had intended coming to Oxford to utter my final protest against the growing multitude of Paleobotanical species mongers who are reducing the study of Paleobotany to a state of inextricable confusion. But I concluded that I should only expend my breath for nought and become engaged in angry controversies, hence I resolved to leave the entire race who find pleasure and renown in attaching the mystic 'mihi' to the vast number of unidentifiable fragments that have now been accumulating from the days of Artis, Sternberg and Brongniart to the present day. I refuse to recognize any one of my names given in my numerous memoirs as being *specific*. They are merely convenient terms helping us to identify certain types of organization—any one of which may embrace an indefinite number of true species, if indeed any such have a real existence."

* Trans. Linn. Soc., Vol. XXVI., 1870, pp. 663–674, pl. lii.–liii.

† Monthly Microsc. Jour., Vol. II., London, 1869, pp. 66–72, pl. xxii.

‡ Proc. Lit. Phil. Soc. Manchester, Vol. VIII., 1869, pp. 36–38; 153–155; Vol. IX., 1890, pp. 7–9; 76–78; Mem. do., 3d Ser., Vol. IV., 1869, pp. 155–179; 1871, pp. 155–183; 284–265; Vol. V., 1871, pp. 28–46, pl. i.–iii., etc.

§ Phil. Trans. Roy. Soc. London, Vol. CLXI., 1871, pp. 477–510, pl. xxiii.–xxix.

To the discussion of Dr. Scott's paper considerable scope was given, and the question involved in the above extracts from this letter occupied the attention of the members. Being called upon by the courteous President of the Section, Prof. Isaac Bailey Balfour, to make some remarks, and having little to say further than to express my great interest in the subject, I felt that I could not better contribute to the discussion than by reading the above extract, which I took the liberty to do.

Although Professor Williamson's labors were so largely confined during the last 25 years of his life to the preparation of this series of memoirs, it must not be supposed that this was all he accomplished. The number of his minor contributions during this period is very large indeed, and several of these papers are of great importance. Especially is this the case with his Monograph of the 'Morphology and Histology of *Stigmaria ficoides*,' published in 1887, which is by far the most complete treatise thus far known on this subject. The total number of his titles, so far as I have been able to collect them together, does not fall far short of 150. This is exclusive of all papers relating to other branches of science, of which there is a great number, including many addresses and lectures. But nearly all of his papers are devoted to setting forth the results of special investigations, chiefly microscopic, upon a great variety of material, which, by the aid of a large corps of trusted collaborators and collectors, he had accumulated in his cabinet. He rarely indulged in philosophic discussion, but on one or two occasions be took a broad view and expressed himself on the larger subjects connected with his lifework. This was notably the case in his address on 'Primeval Vegetation in its Relation to the Doctrines of Natural Selection and Evolution,' published in a volume of Essays and Addresses by Professors in Owens College, Manchester, in 1874, and reviewed by Dr. Asa Gray in the 'American Journal of Science' in the same year.* To the same class also belonged his 'Primitive Ancestors of Living Plants and their Relations to the Doctrine of Evolution,' published in the 'Revue internationale des sciences biologiques' for September, 1883, but there was scarcely a subject in the whole range of paleobotany which had been prominently brought forward by other writers upon which he had not expressed his opinion.

Only once was it my good fortune to meet Professor Williamson. On the occasion referred to, when I met Dr. Scott at Oxford and had appointed a day to examine with him at the Jodrell Laboratory the microscopic slides of *Bennettites Gibsoni* and other species prepared by Count Solms-Laubach, which were in his hands, Dr. Scott, without my knowledge, notified Professor Williamson of this appointment, and when I reached Kew, to my great delight, I found him there. The two or three hours which I spent in his society can only be characterized as charming. Many subjects were discussed, among the most interesting being his friendly differences with the French paleobotanists, and he related in a playful manner how he had gone about it to secure the publication of one of his most telling replies to the French School in the 'Annales des sciences naturelles,' in which they themselves chiefly published—a bomb, as it were, in the enemy's camp. In parting he said to me with moisture in his eyes, "We shall never see each other again." And so it has proved.

If I were to specify which one of the many important discoveries that Professor Williamson has made in the field of paleobotany ought to be regarded as the most valuable, I should not hesitate to name his demonstration of the existence of exogenous structure in the Carboniferous Pteridophytes, or, more broadly stated, the irrefrag-

* 3d Ser., Vol. VIII., pp. 150-151.

able proof which he has brought forward that exogenous structure is not confined to the Spermophytes. That it is so confined was simply a dogma of botany, and when Brongniart, in his classical memoir on *Sigillaria elegans*, published in 1839, so clearly proved that the genus Sigillaria sometimes has such a structure, influenced by this dogma alone, he inclined to place it in the Gymnosperms, and so great was his authority that until very recent times, and to some extent still to-day, his followers in France have labored to sustain that view. Long after Professor Williamson had overthrown it definitively the French School continued to defend it, and it was for this reason that he was induced to contribute the paper above referred to in the 'Annales des sciences naturelles.'* He was determined that they should not have the excuse that his researches were in a language with which they were not familiar, and therefore associated with himself Dr. Marcus M. Hartog, of Victoria University, Manchester, and with the aid of a literary friend of Dr. Hartog in Paris, who put the paper into the very best of French, he set forth in the clearest manner the leading arguments in opposition to the old doctrine, and thrust it directly before the eminent defenders of that doctrine. The effect was instantaneous. The article was read and repeatedly answered, but without weakening the argument, and to-day, with perhaps a single exception, Professor Williamson's conclusions are accepted by the French paleobotanists.

Lester F. Ward.

Washington, D. C.

* Les Sigillaires et les Lepidodendrées, Par. MM. W. C. Williamson et Marcus M. Hartog. Ann. Sci. Nat., Bot., 6e Sér., Vol. XIII., Paris, 1882, pp. 337–352.

JAMES C. PILLING.

James Constantine Pilling, a well-known student of the languages and literature of the Indians of North America, the bibliographer in the Bureau of American Ethnology, died of locomotor ataxia July 26, 1895. He was born in Washington, November 16, 1846, and passed through the public schools and Gonzaga College. At twenty he was a court and Congressional stenographer. In 1875 he became connected with the United States Geographic and Geologic Surveys of the Rocky Mountain region, under Major J. W. Powell. While in the field he displayed notable skill and zeal in the collection of the vocabularies of the native tribes, his experience in stenography proving of great service. By his aid the Director of the Survey was able to collect a large number of myths and traditions, and to record ceremonials with a fulness of detail which would have been impossible without the use of shorthand. In 1881 Mr. Pilling became chief clerk of the Geological Survey and the Ethnologic Bureau, retaining this arduous position until 1891, when failing health compelled discontinuance of a part of his work; thereupon he resigned from the Survey, discontinued administrative work, and devoted his remaining energies with remarkable persistence and success to bibliographic researches. These researches were continued until April last, when he finally became incapacitated.

Mr. Pilling was widely known as a bibliographer of the native languages of North America. Nine parts of his great bibliography have been published, viz.: the Algonquian, Athapascan, Chinookan (including the Chinook jargon), Eskimo, Iroquoian, Muskhogean, Salishan, Siouan and Wakashan. These volumes comprise about 1,700 pages, including over 6,000 titular entries. The work is regarded as a model by bibliographers generally; the successive parts have been favorably reviewed in scientific journals in many countries. Much additional material was prepared, including a

bibliography of the native languages of Mexico, which is nearly ready for publication.

Among his friends and associates Mr. Pilling was highly esteemed for integrity, industry, kindly disposition and strong sense of justice. By reason of these qualities he was a successful administrative officer, contributing much to the accomplishment and prestige of the scientific bureaus with which he was connected.

W J McGEE.

AGROSTOLOGY IN THE DEPARTMENT OF AGRICULTURE.

THE Secretary of Agriculture recommended to the last Congress the establishment in his Department of a division to be known as the 'Division of Agrostology.' This recommendation was approved by Congress, and the law establishing the new division went into effect the first of July. This law authorizes investigations relating to the natural history, geographical distribution, and uses of the various grasses and forage plants and their adaptability to special soils and climates. It also authorizes the preparation of special reports, illustrated circulars of information, bulletins and monographic works on the grasses and forage plants of North America. From this it will be seen that both the practical and scientific sides of the grass and forage questions are to be considered, and in the organization of the division force the Secretary endeavored to cover and provide for all the possible lines of work. The farmer and the botanist are alike interested in it. The Department of Agriculture has always recognized the importance of the investigation of our forage resources, which, at a conservative estimate, have a money value of more than one billion of dollars; and, while the establishment of the new division may not introduce new lines of work, it can not fail to effect a better organization of this work and at the same time demonstrate to the citizens of this and other countries that the United States Government fully appreciates and recognizes the primary importance of the grasses in the rural economy of the Nation. It gives to the work a recognition which its vast importance unquestionably merits.

No country in the world possesses so great and varied forage resources as the United States, and there is none where the maintenance and improvement of these resources is of greater importance. There are over 3,500 different kinds of grasses in the world, more than 700 of which grow within our territory; and besides these grasses there are many useful forage plants which are native to the country, or which have been introduced here from abroad, such as the clovers, alfalfa, the vetches and cowpeas. It will be the function of this new division to instruct and familiarize the people with the habits and uses of all these plants, and to introduce into cultivation promising native and foreign kinds, as well as to identify all grasses and forage plants submitted to the department for identification, and to answer all correspondence relative to these plants.

When the bill for establishing the Division of Agrostology was before the Senate, one Senator remarked: "It is only necessary to state that the grass crop of the country is the foundation of the life of all the animals of the country, to show how important the subject is. What farmers have been doing in past years has been simply to run out the grasses which they had. No attention has been paid to the cultivation and development of grasses, and I am glad to see that the Department of Agriculture is turning its attention to this subject, the most important subject within its purview." Another Senator said, in reference to improving the forage resources of many parts of the semi-arid regions of the West: "It seems to me that in the line

of this investigation, no matter how much it costs, even an appropriation of fifty times the amount carried by the bill, could be profitable expended, if one grass can be obtained of utility to man that will flourish as those worthless plants flourish in that dry arid region."

The division has now in preparation a popular work on the grasses and fodder plants of the country, designed chiefly as a ready reference book for the use of farmers, and also a more elaborate and fully illustrated hand-book of the grasses of North America. The former work will be completed within a year, while the latter, owing to the time required in preparing and executing the illustrations, can not be completed at so early a date. Much time is occupied in the office in identifying grasses sent in by collectors and correspondents, and parties are now in the field, working under the direction of the Chief of the Division, collecting grass seeds, live roots of grasses and forage plants and herbarium specimens, both in the Rocky mountain region and in the Gulf region of the Southern States. Special attention will be given the present season to the sand binders of the Atlantic coast, and to the grasses and other fodder plants which enter into the composition of the hay of the tide-water marshes along the Middle and New England States. This subject, while apparently of local importance, is one of considerable general interest and of much value, as any one who has visited our coasts can not fail to recognize. The agents in the West have been directed to collect in considerable quantity the seeds of all the more promising grasses of the rich grass flora of the Rocky mountain region, with a view of testing the several species under cultivation, particular attention being given to those kinds which appear to thrive and make vigorous growth under the most trying conditions of the arid climates.

The study of living plants and observing their habits of growth, whether in their native station or under cultivation, is absolutely essential to their proper investigation, and to meet this requirement the Secretary has established a grass garden upon the Department grounds, in which already some 400 different varieties of grasses and forage plants are now growing. Owing to the limited area of this garden, the plots assigned to each species are necessarily small, but they are sufficient to test the possibility of the growth of the several kinds in this latitude, and to show very well the peculiar nature of each species. It has been the endeavor to have in this garden illustrative living samples of all the various hay and fodder plants and all grasses advertised by different seedsmen, and to bring together in it all the native grasses which it may be possible to secure. A larger garden, of several acres in extent, has been established in one of the Southern States, where the native grasses peculiar to these States are being tested, and where a considerable area is given to the cultivation of the more promising fodder plants believed to be best adapted to our southern latitudes, both for the purpose of giving these plants a test of a more practical character, such as they would be likely to receive in general culture, and to secure seeds for distribution in cases where such a distribution seems to be desirable.

F. Lamson Scribner.

Division of Agrostology,
Department of Agriculture.

PHOTOTOPOGRAPHY.

Photographs obtained on vertically exposed plates, using a camera with constant focal length and a lens ground especially with a view towards reducing astigmatic and chromatic aberrations to a minimum, giving uniformity in definition and depth over a flat field, may be regarded as geometrically true perspectives.

The true dimensions of objects, represented in perspective view upon a plane surface, are not obtainable by direct measurements with any one scale, but they can be determined, geographically, if the *distance line* (focal length), *the horizon* and the *principal point are known.*

Iconometry, photogrammetry or metrophotography are terms applied to that art which ascertains, graphically, the true dimensions of objects from their perspectively correct (photographic) representations (produced by means of a so-called photogrammeter).

By applying the inverse rules of perspective drawing and aided by a knowledge of descriptive geometry, the horizontal projections of the terrene, obtained by means of a photogrammeter, can be plotted in precisely the same manner as if the measurements were made in the field, instead of being obtained from such photographs.

The fundamental principles underlying this particular branch of photogrammetry—'phototopography'—are, of course, the same as in all other methods of topographical surveying, inasmuch as all require the determination of lengths of lines and angular measurements of the deflections of such lines from a given direction.

Generally speaking, phototopography follows the same lines of procedure as the plane table methods, except that with the latter the control underlying the map is plotted and the chart is drawn in the field, the terrene of the mapped area being before the eyes of the plane-tabler, whereas the iconometrical draughtsman has only the perspective views of the terrene, as seen from known stations, from which he must while in his office gather all the data necessary to construct the same map. Still, the latter has the advantage that he can, at any time, refer back to the terrene (pictorially at his command) surrounding any station, while the plane-tabler rarely occupies the same station twice, notwithstanding such references are very essential aids towards giving the topography a correct interpretation with respect to forms.

In both cases the chart is constructed by means of visual rays or lines of direction, drawn from different stations towards the same point, the cartographic position of which is found by locating the point of intersection of such lines, observed from different stations.

With the plane-table such intersections are made (or plotted) by bisecting the objects or signals with the (telescopic) alidade, and actually drawing the lines of direction observed from different stations to the same point, upon the plane-table sheet, thus plotting the horizontal angles (graphically) without knowing their values in arc.

In phototopography the lines of direction (in both the vertical and horizontal sense) to the various points, identified on different panorama views and selected for plotting, are found by transposing linear measurements taken (as rectangular coordinates) from the negatives or prints, which, together with the camera constants, will enable the iconometrical draughtsman to graphically locate the lines of direction and plot the points (selected on the pictures) by intersections of the same.

Such being the case, it is evident that the smallest length measurable with eye and scale will represent the limit within which the points of the map can be correctly laid down, and it becomes advisable to use a large scale for good photogrammetrical plotting.

The work of drawing in the horizontal contours, after a sufficient number of points have been located on the chart, hypsometrically and geographically, is done in the same manner (by graphical interpolation) as in the field, when using the plane-table, except that in iconometrical plotting frequent reference is taken to the pictures of

the area in question (as seen from different camera stations), they being studied in the same way as the plane-tabler studies the surrounding terrene to grasp its characteristic forms and represent the same on the map as a faithful translation.

Among the advantages of applying photography, in the manner suggested, to surveying are:

1. With the same material brought home from the field, large or small scale maps can be constructed, and the plotting can be made detailed or generalized by deducing a large or a small number of geodetic control points from the photographs.

2. The phototopographic map construction can be carried on at the home office while the observer remains in the field, sending in the data as soon as they may be acquired. This renders metrophotography especially well adapted for the use of scientific explorers.

3. The field season is reduced to a minimum, no instrumental observations being required beyond the triangulation which forms the basis for the map. Hence, this method is to be recommended for surveys in mountainous regions, in arid countries or where fogs and smoke prevail, in short, where it is desirable to gather much topographical information in a short time.

Since this method has been developed it has been used successfully by explorers, topographers, military engineers, geologists, hydrographers, etc.

It has been employed with marked success for topographical surveys of large areas in mountain regions in Italy (Mil. Geographical Inst., L. P. Paganini), Austria (Professor Steiner, Pollack, Hafferl, Hübl, Lechner, etc.); Canada (Capt. E. Deville, Surveyor General); France (Col. A. Laussedat; Commandants Javary, Moessard and Le Gros; Dr. Le Bon, Ed. Monet, etc.); and in Germany (Dr. Meydenbaur, Dr. Doergens, Dr. Hauck, Dr. Vogel, Professor Jordan, Dr. Koppe, Dr. Pietsch, etc.). Also for astronomical observations photography has been applied in a similar manner by M. G. Flammarion in France and by Dr. Stolze and C. Runge in Germany.

Phototopography is being practiced now in Greece, Spain, Portugal, Norway, Mexico, Chile, Peru, Brazil, Switzerland, England, and more recently still in the United States, although this art-science has been taught, both in theory and practice, at the Military Academy at West Point by Lieut. H. A. Reed for several years past.

The Coast and Geodetic Survey has, in the past and in the present season, used the phototopographic method in a modified form for the topographical reconnoissance of regions in southeastern Alaska; while phototopography has been used exclusively by the Dominion Land Surveyors for similar work along the boundary between Alaska and British Columbia under Dr. W. F. King, Commissioner to H. M. in 1893 and 1894.

J. A. Flemer.

Washington, D. C.

THE INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

The committee appointed by the President and Council of the Royal Society to enquire into and report upon the feasibility of a catalogue of scientific literature through international coöperation presented their report on July 5th. It is as follows (we quote from *Nature*):

At the first meeting of this Committee (February 8, 1894), the Memorial to the President and Council (July, 1893) which led to the appointment of the Committee, and the Minute of Council of December 7, 1893, appointing the Committee, having been read, it was resolved to request the President and Council to authorize the Committee to enter directly into communication with societies, institutions, etc., in this country and abroad, with reference to the

preparation, by international coöperation, of complete subject and authors' catalogues of scientific literature.

Subsequently, a draft circular letter was prepared, which, on February 22, 1894, received the approval of the President and Council, who also authorized its issue.

This letter was sent to 207 societies and institutions selected from the exchange list of the Royal Society, and to a few others. It was also sent to the directors of a number of observatories and of government geological surveys, to the foreign members of the Royal Society, as well as to those of the following societies: Chemical, Geological, Physical, Royal Astronomical, Linnæan, Royal Microscopical, Entomological, Zoological, Physiological and Mineralogical, and of the Anthropological Institute. A special letter was addressed to the Smithsonian Institution.

More than a hundred replies to the letter have been received; several of these are reports of committees specially appointed to consider the suggestions put forward by the Royal Society. A list of answers received up to December, 1894, with brief excerpts from the more suggestive, was issued to members of the Committee early in this year. It should, however, be added that from some important institutions no answer has as yet been received.

It may be said at the outset that in no single case is any doubt expressed as to the extreme value of the work contemplated, and that only two or three correspondents question whether it be possible to carry out such a work. It is a great gratification to the Committee that the matter has been taken up in a most cordial manner by the Smithsonian Institution, the Secretary of which, in his reply, refers to the desirability of a catalogue of the kind suggested as being so obvious that the work commends itself at once. The importance of having complete subject catalogues, and not mere transcripts of titles, is also generally recognised.

Some bodies and individuals take the matter up very warmly and urge that steps be taken forthwith to put the scheme into action, this being especially true of the replies received from the United States; others, while giving a general approval, dwell upon the difficulties of carrying out the suggestions put forward; and others, again, ask for more details before committing themselves to any answer which may seem to entail future responsibility, especially of a financial character.

Incidentally it may be pointed out as very noteworthy that over and over again reference is made to the great value of the Royal Society's 'Catalogue of Scientific Papers.' There is abundant evidence that considerable use is made of this on the continent of Europe. And it is clear that a proposal to carry out a more comprehensive scheme initially under the direction of the Royal Society of London is likely to meet with general approval, owing to the fact that the Society is credited with having already carried out the most comprehensive work of the kind yet attempted. Indeed, the Academy of Natural Sciences of Philadelphia, U. S. A., directly advocates the establishment of a central bureau under the Royal Society; and several others more or less clearly imply that they would favor such a course.

Over and over again, it is stated that the production, by international coöperation, of a catalogue such as is contemplated is not only desirable but practicable. The Americans, who, as already stated, are the most enthusiastic supporters of the scheme, especially dwell on the importance of early action being taken. Professor Bowditch, of Harvard University, in particular, points out that if the Royal Society of London wish to guide the enterprise it ought to announce its views and put forward a compre-

hensive scheme with the least possible delay. It may be added here that he also urges that in determining the scope of the catalogue a very wide interpretation should be given to the word 'Science.'

No very precise information as to the best mode of putting the scheme into operation is to be gathered from the replies as a whole.

It is generally agreed that the enterprise should be an international one. Many think that international financial support should and would be accorded to it, but no method of securing this is indicated; others express the view that the cost may be met by subscriptions from societies, libraries, booksellers and individuals without government aid, and this is, perhaps, on the whole, the prevailing feeling among those who have discussed the matter from a financial point of view. But in no case is any attempt made to form any exact estimate of the cost.

A number of scientific bodies and institutions express themselves prepared to work in such a cause. The Secretary of the Smithsonian Institution suggests that, as the Institution receives all the serials and independent works published in America, a branch office might be established there, and that it is not impossible that a sum of money might be given yearly in aid. The Royal Danish Academy is willing to render as much assistance as possible. It would charge an official of one of the Danish chief libraries in receipt of all Danish publications with the task of editing slips, and would defray the cost of this work. The Société des Sciences of Helsingfors would furnish the central office with information as to the scientific work done in Finland. The Kongl. Vetenskaps Akademie of Stockholm would organize a Committee for Sweden.

As regards language, there appears to be more unanimity than could have been expected. Over and over again the opinion is expressed that English should be the language of the subject catalogue. Frequent reference is made to the importance of quoting titles in the original language, although some suggest that this should be done only in the case of those published in English, French or German, and perhaps Italian.

Some form of card catalogue appears to be generally favored, especially in America, as the basis of the scheme; the Committee of Harvard University, whose reply is very full, in particular discuss this point in detail.

In an interview with the Committee in March last, Professor Agassiz spoke very warmly in favor of the scheme, and of the support which it would meet with in the United States, especially from libraries. As others have done, he urged that the cooperation of booksellers and authors should be secured. Professor Agassiz also expressed the view that the regular issue, to libraries and scientific workers, from the central office, of cards or slips which would afford the material for the construction of card catalogues would form an important source of income, at all events in his country.

From various sides it is urged that an International Congress should be held to discuss plans. This is advocated as a first step in a reply received from the Königl. Gesellschaft der Wissenschaften in Göttingen, a reply to which, not only as regards this point, but also in respect to the whole matter, the Committee attach very great weight, since it embodies in an official form views arrived at by the Academies of Vienna and Munich, and by the scientific societies of Leipzig and Göttingen, who have considered the matter in common. Professor Agassiz strongly urged the calling of a conference, and among others who share this view, Dr. Gill, of the Cape Observatory, in his letter particularly dwells on

the great value of such meetings as the means of securing unanimity of action.

Such being the tenor of the correspondence, your Committee are convinced that initial steps of a definite nature in furtherance of the scheme ought now to be taken.

They accordingly request the President and Counsel to take measures with the view of calling together, in July of next year (1896), an International Conference, at which representatives of the several nations engaged in scientific work should be invited to attend, with the view of discussing and settling a detailed scheme for the production, by international coöperation, of complete authors' and subject catalogues of scientific literature.

London will probably be found the best place in which to hold such a conference. It may be desirable to summon the representatives of the different countries through their respective governments, and it will obviously be necessary that a detailed scheme be prepared, to serve as a basis for discussion at the conference. These and other points will require much consideration before any action at all can be taken; meanwhile it is desirable that a beginning should be made during the autumn, before the winter session of the Society. The Committee therefore recommend that the President and Council should give the Committee (which includes the President and officers) executive powers in order that they may take, in the name of the Society, such steps as they may think desirable, with the view of calling together the above-mentioned conference.

NOTES FROM LONDON.

A DAY with Mr. Maxim and his wonderful gun and more marvelous flying-machine has proved one of the most interesting of our tour to date. The flying-machine is completely repaired, and in as good working order as before its famous flight and unlucky accident. Mr. Maxim's lease has nearly expired, however, and little more can be done until he is reëstablished in new quarters. He has, at Bexley, only about 1800 feet range, and for further operations desires at least a mile. It may be difficult to find precisely the location suitable for the work. It would be fortunate for the inventor, for science and for the country, could the new location be found in the United States, with ample funds for the experiment. Mechanically, the machine is a success; but much experience is likely to be required to give its operation certainty and safety. The reduction to practice of the art of flying may probably prove a more serious matter than the solution of the purely mechanical problems involved.

THE Maxim gun is perhaps the most extraordinary implement of war ever devised. The pressing of a button is all that is required of the gunner, the gun loading itself and firing automatically, at the rate of 600 to 800 shots a minute, until the finger is removed or until the ammunition is exhausted. All the needed energy in working the mechanism is supplied by the recoil of the barrel of the gun. Hundreds of these guns have been supplied European and Oriental nations, and they have already done much effective work. It seems hardly creditable to the ordnance authorities of the United States that they should have permitted foreign nations to lead in utilizing so great an American invention. Mr. Maxim has not imbibed much respect for our officials, or our methods of treatment of inventors in this department of applied science, from his personal experience at home.

THE Henley races have come and gone, and the most interesting feature, to Americans, proved disappointing. In the races for the Grand Challenge Cup, Cornell won from Leander by an error on the part of the umpire, and was beaten by Trinity Hall. The result is claimed by advocates of the long

stroke, adopted by British oarsmen, and imported into the United States by Yale, to be proof of its efficiency as against the stroke adopted by Cornell for short races.

The friends of the latter deny this, and state that their crew left America in fine condition, having beaten Henley time on their own Cayuga Lake course; that they continued in excellent condition, on this side the Atlantic, making in trial races the best records of the season. Their best figure for 1 mile 550 yards was 7 m. 4½ sec., as against Leander's 7 m. 14 sec. Trinity finally beat them in 7 m. 15 sec., 'easily,' although the 'Yankees' held the lead for half the course. In the last two weeks of their stay the Cornell crew had suffered from the enervating effect of the unaccustomed climate, and suddenly lost their staying power. The event was anticipated by those who watched them most closely days before the races. The men themselves say they have lost no faith in boats, stroke or coaching system, and when in condition are ready to meet any crew which appeared at Henley. They had made better time and held their speed on much longer courses.

The matter has some scientific interest and even importance. Improved oarsmanship means much outside athletic circles. There is certainly a stroke of maximum efficiency which will, with a stated expenditure of muscular power, give the greatest possible work in the line of the boat's keel. It is this really important problem that is likely now to be solved on our home waters; for no change is likely to occur on British waters. Yale and Cornell will perhaps finally settle the question by fighting to a conclusion at home.

The London Times has been recently publishing letters from its correspondent at Kiel, in which are criticised, by a naval expert, the warships of various nationalities there represented. He considers the 'Columbia' defective in offensive and defensive power, although a marvel of speed, and likely to prove a success in our special province, that of 'commerce-destroyer.' He thinks the French iron-clad 'Dupuy de Lõrne' their best approximation to British standards, and speaks very lightly of the ships built by the Russians for their Baltic fleet. The U. S. S. 'New York' is classed with the best.

I had the pleasure of meeting Lord Kelvin last week for the first time since the meeting of the British Association of 1884 at Montreal. He bears the added years remarkably well and appears quite as much interested as ever in America, Americans and scientific work on the other side of the Atlantic. He is engaged, with Sir John Lubbock, Lord Rayleigh and other distinguished men of science, in a movement having for its object the erection of a memorial to the late Professor Huxley, whose death, on the 29th ultimo, was a source of grief to all scientific men, and many divines as well, on both sides of the Atlantic.

R. H. T.

London, July 16, 1895.

SCIENTIFIC NOTES AND NEWS.

FOSSIL MAMMALS OF PATAGONIA.

Dr. Florentino Ameghino, of La Plata, has recently published an important pamphlet, '*Sur les ongulés fossiles de l'Argentine*,' which includes an exhaustive criticism of the recent memoirs of Mr. Lydekker entitled 'A Study of the Extinct Ungulates of Argentina,' recently noticed in Science. Dr. Ameghino goes over Mr. Lydekker's work page by page and points out a number of grave errors arising from the fact that the author confined his studies entirely to the collections in the National Museum and did not examine the very rich private collection of Dr. Ameghino. We noted as a special feature of Mr. Lydekker's handsome memoirs that the English and Span-

ish texts are placed in parallel columns. Dr. Ameghino shows that the Spanish translation is full of errors and frequently directly contradicts the statements made in the English text. Most of the criticisms seem to be thoroughly justified. In conclusion Dr. Ameghino says: "It only remains for Mr. Lydekker to recommence his work with more deliberation and more material. If he should decide to do this I offer him my assistance without any reference to his previous oversight of my researches. My collection of fossil mammals of Argentina contains about 750 species, represented by 50,000 specimens, which I place at his disposal with all the accompanying catalogues and notes."

IT is very significant that the most striking studies in paleontology at the present time are among the Theromora, or mammalian-like reptiles which Professor Seely is describing from South Africa, and among this rich, true mammalian fauna of South America. Both the South American and South African continents terminate at present in restricted land areas, but both give evidence of a highly varied and rich land vertebrate fauna in Mesozoic and early Tertiary times. These facts alone point to a far greater former extension of these land areas, and even to extensive connections of the southern continents, similar to those which existed in former times between the northern continents. Dr. Ameghino has referred a large number of the Patagonian mammals to the Marsupialia, and they certainly present many striking resemblances to the Australian marsupials, but none which appear to us absolutely demonstrative of marsupial descent.

A STILL later bulletin from Dr. Ameghino contains a notice of the '*Pyrotherium Beds*' which were discovered in 1888 in western Patagonia, in the province of Neuquen. The last expedition made by M. Carlos Ameghino was especially directed to determining the geological and faunal characters of this formation. From the geological point of view the results obtained are of the greatest importance. The Pyrotherium beds are of lacustrine origin and lie in a vast cretaceous basin which is full of remains of Dinosauria. At several points these beds are found to underlie the Patagonian deposits, which are generally considered contemporaneous with our lower Miocene. The region where the beds are exposed is very similar to that of the Rocky Mountain lake basins, absolutely desert, deeply eroded, and almost everywhere so dry that it is necessary to transport the water supply long distances by muleback. The most abundant and characteristic mammal of these beds is Pyrotherium. It is referred by Dr. Ameghino to a sub-order of ungulates which he considers as the direct source of the Proboscidia: "If this large mammal had been found in Europe or Asia no one would have hesitated to regard it as uniting the characteristics of the Dinotherium and Mastodon. The structure of the lower teeth, of the mandible and of the femur is purely proboscidian; the astragalus, however, is of a profoundly different type, and to a certain degree is comparable to that of the marsupials." He considers that the Pyrotheria represent a group of ungulates which have relations to the marsupials, but none the less represent the ancestors of the Proboscidia. It is impossible to accept such a conclusion, and it seems difficult to determine from Dr. Ameghino's figures whether this large mammal represents a gigantic marsupial related to the kangaroo or whether it is the long sought placental ancestor of the Proboscidia. It presents a single pair of lower incisors, like those of the diprotodont marsupials, but also somewhat similar to those of the oldest types of Mastodon, such as *M. angustigenis*.

COMPARATIVE NEUROLOGY.

We have just received Dr. Ludwig Edinger's *Bericht über die Leistungen auf dem Gebiete der Anatomie des Centralnervensystems*, 1893, 1894. (Schmidt's Jahrbücher d. Ges. Medicin.) These reviews began in 1885 and the rapid advance of comparative neurology is well indicated by the 345 titles in the present *Bericht*. Dr. Edinger sums up the present tendencies of research as follows:

"It is a special subject of congratulation that investigations are increasing upon the anatomy of the simpler types of brains and upon certain fibre tracts in the lower orders of mammals, in which these tracts are much better displayed than in the higher mammalia, which have been chiefly investigated hitherto. In general, as a result of this work, we have gained a deeper insight, and have placed the relations of certain tracts upon a firmer comparative basis. The admirable method of Marchi has come into more frequent use than heretofore, especially in the study of secondary degeneration in the hemispheres, in the thalami, crura cerebri, and a great many new facts have thus been brought out. Study upon the olfactory fibre tracts has been renewed with great success, after a long interval in which these tracts have been somewhat neglected; in fact, research in this region was completely stagnant until the discovery of the 'glomerular structure' finally made it possible to determine the separate regions of the olfactory system more accurately. This discovery also made it possible to unify the results obtained in comparative anatomy, and to separate a distinct portion of the forebrain with its tracts as part of the olfactory apparatus proper. This discovery also threw new light upon the development of the mantle of the hemispheres, a region in which far more progress has been made since it has been found that there are certain clearly defined cortical regions with as clearly defined anatomical relations.

"Numerous researches upon the arrangement of the cells in special 'nuclei' of the nervous system give a constantly increasing insight into their finer structure. It should also be specially noticed that during the last two years has been renewed the study of the changes which take place in the ganglion cells during periods of function and rest; in old age, death and in disease. Here is also a field which promises very rich results. * * With the above grounds for satisfaction, I still cannot let the report of this year go by without expressing a regret for the custom, which seems to be constantly increasing, of rapidly publishing isolated and small observations, while longer and more thorough researches are becoming more infrequent. It would be a serious blow to this branch of research, which has hitherto been followed with scientific exactness, if the large number of hastily prepared researches of beginners should gain the preponderance. My warning is especially directed against conclusions of a far-reaching character which are founded upon a limited number of observations."

THE AMERICAN MICROSCOPICAL SOCIETY.

The eighteenth annual meeting of the Society will be held at Cornell University, Ithaca, N. Y., for three days, beginning on the morning of August 21st. The accommodations afforded by the University buildings, and their equipment for carrying on all lines of microscopical work, add very materially to the attractiveness of Ithaca as a place of meeting. Add to this the richness of both terrestrial and aquatic fauna and flora, and it is almost an ideal place, both to the student of natural history and to those who love beautiful scenery. A large and influential local committee, with Professor W. W. Rowlee as chairman, has

been formed, and everything will be done within its power that will contribute to the comfort and enjoyment of the members and their friends.

The address of the President, Professor S. H. Gage, on 'The Processes of Life Revealed by the Microscope,' will be given on the evening of August 21st, and the preliminary list of papers promised for the meeting already includes twenty-seven titles.

AMERICAN MATHEMATICAL SOCIETY.

THE Society will hold its second summer meeting at Springfield, Mass., on August 27th and 28th, 1895, under the auspices of the American Association for the Advancement of Science. There will be four sessions, two on each day, beginning respectively at 10 a. m. and 2:30 p. m.

Papers are promised by Dr. G. W. Hill, Prof. E. H. Moore, Prof. G. B. Halsted, Prof. J. B. Shaw, Prof. F. Morley, Prof. A. L. Baker, Dr. A. Martin, Prof. J. McMahon, Prof. W. H. Echols and Mr. P. A. Lambert. At the session in the afternoon of the second day, two topics will be open to the Society for general discussion, viz.: (1.) A general subject catalogue or index of mathematical literature. (2.) The mathematical curriculum of the college and scientific school.

Programs of the meeting may be obtained from the Secretary, Prof. Thomas S. Fiske, Columbia College, New York.

THE HELMHOLTZ MEMORIAL.

CONTRIBUTIONS from Princeton to the Helmholtz Memorial, collected by Professor J. Mark Baldwin, are as follows, amounting to $138:

F. L. Patton,	$10
W. M. Sloane,	10
C. W. Shields,	10
C. A. Young,	5
A. F. West,	5
Woodrow Wilson,	$5
W. M. Daniels,	5
Allen Marquand,	5
H. C. O. Huss,	3
J. H. Westcott,	5
E. C. Richardson,	5
H. C. Warren,	3
W. Humphreys,	3
F. N. Wilson,	3
Charles McMillen,	3
C. F. Brackett,	5
W. F. Magie,	5
E. H. Loomis,	5
H. S. S. Smith,	5
C. R. Rockwood,	5
L. W. McCay,	5
Taylor Reed,	5
H. B. Fine,	5
W. Libbey, Jr.,	5
Geo. Macloskie,	3
J. Mark Baldwin,	10
Total,	$138

GENERAL.

THE tenth number of the excellent series of bulletins issued by the department of geology of the University of California is on *Lowsonite, a New-Rock-Forming Mineral from the Tiburon Peninsula, Marion county, Cal.* The author, Mr. F. Leslie Ransome, describes the crystal form, the optical properties, the chemical composition and the general physical properties and blow-pipe reactions of the mineral. It occurs in the form of white crystals projecting from an outcrop of crystalline chist and also in veins traversing the chist.

AN international congress for the protection of birds useful in agriculture was held recently in Paris, attended by delegates from France, Great Britain, Germany, Austria, Russia, Switzerland, Holland, Italy, Greece and Spain. The congress defined the birds injurious and useful to agriculture and requested all the nations taking part in the congress should pass within three years

laws absolutely protecting useful birds. They are to be neither killed nor taken alive under any circumstances.

According to *The Lancet* the number of cases treated gratuitously in the London clinics rose from about two and a-half millions in 1890 to more than four millions in 1894.

As far as can be judged from the cable dispatches, the topic which attracted most attention at the International Geographical Congress was polar exploration. A resolution was passed affirming that the greatest geographical exploration yet to be undertaken was to be pursued in Antarctic fields, in view of great additions to geographical knowledge which must result from such exploration. It was therefore recommended that the assembled scientific societies throughout the world urge in whatever way seems to them most effective that this work be undertaken before the close of the century. The Congress adopted the resolution of the Vice-Presidents recommending Berlin as the place for the meeting of 1896.

Prof. S. J. Brown, of the United States Naval Observatory, has been sent on a mission with instructions to visit the observatories at Greenwich, Paris and Berlin, and report to the department on their operations and administration.

It is proposed to erect a statue of the anatomist Corydon L. Ford, on the campus of the University of Michigan. Subscriptions are invited for this purpose, which may be sent to Dr. C. E. Stroud, Sandusky, Ohio.

The revised edition of von Helmholtz's great work, 'Handbuch der physiologischen Optik,' is now approaching completion, the 12th part having just been issued. The publication of the new edition was begun in 1885, but proceeded slowly, von Helmholtz being occupied with other work. The eighth part was issued in 1894, but since the death of von Helmholtz four parts have been published under the editorship of Prof. Arthur König. The part now issued contains sections on binocular vision, on rivalry of the fields of vision and the beginning of a discussion on the psychological theories of binocular vision.

Mr. John K. Hillers, photographer of the Geological Survey, has prepared, under the supervision of Mr. Charles D. Walcott, Director of the Survey, a collection of photographic transparencies for the Atlanta Exposition.

A number of transfers and promotions have been made in the Weather Bureau by order of Secretary Morton, among which we may note that Edward E. Gerriot has been placed in charge of the Station at Chicago with a salary of $2,500 per annum, succeeding Willis N. Moore, now Chief of the Weather Bureau, and that Mr. Alexander McAdie has been transferred from Washington to San Francisco.

The Literary Digest is doing excellent work in the popularization of science by publishing each week four pages which contain abstracts and quotations, selected and edited with much skill, in reference to the more generally interesting aspects of scientific progress.

According to the Washington *Star* a new departure has been made in the publication work of the Agricultural Department. Hereafter it will call upon specialists in certain lines of agricultural work, though not connected with the office, to make investigations of importance to agricultural interests and to prepare brief papers or articles embracing the results of the work. These will be paid for at rates which the Department regards as reasonable, the funds being provided for in the Congressional appropriations. Many persons well known here and abroad will be asked to contribute.

DR. WILLIAM C. JARVIS, professor of diseases of the throat at the University of New York, died at Willett's Point on July 30th.

DANIEL G. HATCH, of the Bureau of Animal Industry of the Department of Agriculture, died on August 1st.

PROFESSOR G. F. W. SPÖRER, astronomer in the astrophysical observatory at Potsdam, died on July 7th at the age of 73, and Dr. Josef Loschmidt, professor of physics in Vienna, died on July 8th at the age of 74.

PROFESSOR HEINRICH VON SYBEL, the historian, died at Marburg on August 1st at the age of 78 years.

UNIVERSITY AND EDUCATIONAL NEWS.

THE Berlin correspondent of the New York *Evening Post* states that there are an unusually large number of American students now studying in Germany. 109 Americans are matriculated in the University of Berlin, and there are a large number of others pursuing special studies in clinics and other institutions. The total number of American students in the German universities is estimated at 340; it is said that in some of the laboratories nearly half the research work is being done by American students. The fact that the Summer Semester in Germany continues in session until the first of August gives American students an excellent opportunity to become acquainted with German university life and methods without interrupting their academic course at home.

The number of American students studying in Germany far exceeds the number studying in France. This is partly owing to the fact that the German university is more liberal in the admission of foreign students and in the conferring of degrees. A meeting has, however, recently been held at the Sorbonne, under the presidency of M. Gréard, with a view to making modifications in the rules governing the conferment of academic degrees and other regulations, so that more foreign students may be attracted to Paris.

WE learn from the *Naturwissenschaftliche Rundschau* that Dr. Fr. Richart, *Privat Docent* in Bonn, has been elected full professor of physics in the University of Greifswald, as successor to Professor Overbeck. Dr. O. Wiener has been called to the chair of physics in the University of Giessen. Dr. H. Lenk has been made assistant professor of geology in the University of Leipzig, and Dr. Stäckel, of Halle, assistant professor of mathematics in the University of Königsberg.

THE University of Edinburgh has conferred the degree of LL.D. upon Dr. S. Weir Mitchell.

THE Princeton preparatory school, of which Professor John B. Fine is head master, has been purchased by a number of the alumni of Princeton College and incorporated under the laws of New Jersey.

IT is reported by cable from Dublin that it is probable that the government will shortly bring forward a plan to establish and endow a Catholic university in Ireland.

THE will of the late Thomas O. P. Burnham gives nearly $400,000 to charitable and public purposes, including $20,000 to the Massachusetts Institute of Technology and $10,000 to Tufts College. The will of the late Dr. Edward Spalding gives $5,000 to Dartmouth College; $3,000 has reverted to Dartmouth College as provided for in the will of the late Sophronia C. Thompson.

A COMMITTEE from the Legislature of the State of Kansas finds that nearly $200,000 of the State School Fund has been lost through mismanagement. The fund now amounts to between six and seven million dollars.

THE State Department has received a report from the consul at Stuttgart, in which

he attributes the extension of the German export trade to the Stuttgart Geographical Society and similar institutions.

The University of Minnesota at its commencement of the current year conferred 294 degrees as follows: Science, Literature and the Arts, B. A., 28; B. S., 32; B. L., 34; M. A., 3; M. S., 6; Ph. D., 1. Engineering, Metallurgy and the Mechanic Arts, B. C. E., 4; B. M. E., 3; B. E. E., 7; B. Min. E., 1; Min. E., 1. Agriculture, 2. Law, LL. B., 88; LL. M., 2. Medicine and Surgery, M. D., 53. Homeop. Medicine and Surgery, M. D., 5. Dentistry, D. D. M., 12. Pharmacy, Phm. D., 12.

CORRESPONDENCE.

WHAT IS 'HIGH WORK?'

The students of the physiology and morphology of plants are fond of saying that these features of plant life stand for higher work than the older systematic treatment of botanical objects. My attention is called to this attitude of mind at this time by Professor Trelease's remark (although he himself does not subscribe to the sentiment) in Science for July 5th, in reviewing Mr. Small's excellent monograph of Polygonum, that "it is generally believed that the classification and naming of plants is a less advanced branch of botanical investigation than the study of their morphology, development and physiology." I must strenuously object to a comparison of natural objects in terms which are subjective to the student. There is no higher or lower in the forms of life, or in the problems which center about them. Every item in the material universe is worthy the attention of the best mind for a lifetime, and it is bigotry for one student to measure other subjects by the standard of his own specialty. 'High work' is entirely a subjective matter, and is not a quality of the object studied. One man may do 'higher' or 'more advanced' work studying road dust than another may in studying star dust.

L. H. Bailey.

SCIENTIFIC LITERATURE.

The Female Offender. Cæsar Lombroso and William Ferrero. With an introduction by W. Douglas Morrison. Illustrated. The Criminology Series. New York, D. Appleton & Co. 1895. 8°. Pl. 313.

The present work of Lombroso has an introduction by Mr. Douglas Morrison, a perusal of which should disarm all criticism against the body of the work which follows, for Mr. Morrison assures us that the essential aim of Lombroso's work here is to show the public that there are different kinds of criminals and that different kinds of punishments should be provided for them. In other words, the book is a contribution both to penology and to philanthropy. It is encouraging at this time to hear such words of kindliness regarding the Italian criminologist. Largely, perhaps, through the instrumentality of Dr. Nordau's extravagances, the literary and artistic public have come to regard Lombroso with great suspicion. The attitude, in fact, toward this philosopher reminds us very much of the attitude of the religious world toward Darwin some years ago. Nothing that that eminent scientist produced was then received without questioning, and the descent of man was as much a matter of public interest and secular joke as is the existence of degenerative traits at the present time.

Lombroso's present work cannot excite much adverse criticism, for the reason that it is largely a collection of facts and statistics, measurements and tables; in fact, so much so that the book becomes rather too technical to interest the general reader. The author endeavors to determine the physical characteristics belonging to the female criminal, including the prostitute.

He gives first a series of anthropometrical measurements of the skull and of the brain, and then describes what he calls the pathological anatomy of the criminal. In other words, those anomalies which would come under the head of pathology, rather than some variation in simple normal measurements.

Professor Lombroso admits that there is very little to be learned from anthropometry in connection with the present study. It is only by comparison of a very large number of very carefully taken measurements that differences between normal and abnormal women can be discovered. It is in the line of the pathological anomalies that he finds the most to attract his attention. Generally speaking, he finds that the anomalies in the female offender are less than in the males of the corresponding class. So far as the skulls are concerned, he states that the skull of criminal woman approximates somewhat to the male skull, especially in the heaviness of the lower jaw-bone, in the exaggeration of the supra-ciliary ridges, and in peculiarities of the occipital region. As regards the brain of female offenders, the anomalies in structure and size are few. There are, however, very often pathological conditions which are of a striking character. Thus in one-third of thirty-three female criminals, there were found gross lesions of the central nervous system.

In making a summary of the chapters on anthropometry of female criminals, Lombroso confesses that the cumulative figures do not amount to much, and he affirms again that the stability of type is much greater in woman than in man. Still he asserts that in female criminals, the height, the stretch of arms and limbs, are less than normal, while in proportion to the height the average weight of certain classes of criminal women is greater than in moral women. Lombroso asserts that grayness is rarer in the normal women than in criminal women, while baldness is less common in this latter class.

The author's chapter on facial and head anomalies of female criminals seems to us to be full of industriously collected figures, which have, at present, a very slight value. He asserts, however, as a conclusion from a study of them, that these anomalies of the face and body are much more frequent in the female criminal than in the moral classes. The asymmetrical face, strabismus, virile and Mongolian types of physiognomy, out-standing ears, crooked nose, hairiness, prehensile feet, large jaws and cheek bones and anomalous teeth, are among the stigmata that are mentioned. He endeavors to show that certain kinds of criminals have more of these stigmata than others, but no generalization is attempted.

A number of chapters follow upon the physiognomy of female criminals, on tattooing of the offender and on the acuteness of their various special senses, and the book concludes with studies upon the psychology of the born criminal, the occasional criminal and discussions upon hysterical criminals and crimes of passion.

The book as a whole leaves the impression that the author has not made very much headway in establishing a criminal type which can be determined by physical characteristics alone. Still, he has accumulated a large number of facts, and when this is still more increased, particularly by observations on normal women and upon women of different races, some deductions may perhaps be drawn.

The general chapters which bear upon the subject of the production of criminals are interesting and form a valuable contribution to penology.

CHARLES L. DANA.

NEW YORK.

Bildungselemente und erziehlicher Wert des Unterrichts in der Chemie. VON PROF. DR. RUDOLF ARENDT. Voss, Hamburg and

Leipzig. 1895. 8vo. Pp. 103. Price, 2 marks.

Under the above title Professor Arendt has reprinted the introductory chapters of his book, called 'Technik der Experimental Chemie,' and in these he points out the great advantages that are to be gained by a study of the natural sciences in the secondary schools. In order that the pupils of these schools may gain the greatest possible benefit from such study he recommends that they be taught physics and chemistry, and that the instruction in the purely descriptive sciences, such as botany and physiology, be omitted. In the lower classes he insists that the treatment of these sciences must be purely empirical. Facts must be collected and arranged systematically. All speculative discussion in regard to things that lie beyond what can be observed, and all hypotheses of a metaphysical kind, must be avoided. The minds of the pupils must first be furnished with a sufficiently broad knowledge of the facts of observation before the attempt is made to make a more profound study of physical and chemical phenomena. It is only in the higher classes that subjects of a theoretical nature are to be considered, and then great care must be taken by the teacher to present these subjects in their true light, so that the students may clearly apprehend what is fact and what is hypothesis.

The author considers first how conceptions and ideas are formed in studying changes in material things, then how the results of observation and experiment are to be arranged and classified and how generalizations are to be reached. The inductive method of working is explained in great detail, and the author calls attention to the unusually good opportunity which the study of chemistry offers for making students thoroughly familiar with this method of investigating nature.

The last chapter deals with the practical details of instruction, what to teach and how to teach it. He recommends what he calls the synthetic method. The course begins with a consideration of the more important metals. The characteristic properties of these are discussed; then the changes that they undergo when they are heated in the air are examined experimentally. The causes of these changes are found to be due to the action of one constituent of the air. By further experiments the student is led to discover oxygen, to determine the composition of air and water. The action of oxygen upon combustibles is then taken up, and this leads to the determination of the nature of combustion. After the student has in this way learned something about the class of bodies called oxides he starts again with the metals and studies the effect of chlorine and sulphur upon them. Thus a knowledge of chlorides and sulphides is obtained. A comparative study is then made of the oxides, sulphides and chlorides, and the methods of transforming the members of one class into those of the other classes are considered. The course of instruction is continued in this way until the student has learned something about all of the more important elements and compounds. Throughout the entire course the inductive method is used, the student being constantly called upon to draw his own conclusions from the experiments and then to test these conclusions by means of new experiments.

Admirable as this plan seems to be for the instruction of young students, where the course can be extended through a series of years, it can hardly be regarded as a satisfactory one for more advanced students. It is only the simpler laws that can be worked out inductively by the students. The greater number have to be imparted to them directly, and the explanation given of how these laws were discovered and upon what basis they rest. The most that the

students can do is to verifiy some of them by means of one or two examples which illustrate them. Nevertheless, the plan of replacing the purely descriptive work in science by something which makes the students think, and makes them test the accuracy of their conclusions by means of new experiments, is greatly to be recommended.

E. H. K.

SCIENTIFIC JOURNALS.

BOTANICAL GAZETTE, JULY.*

Undescribed Plants from Guatemala and other Central American Republics, XV.: JOHN DONNELL SMITH.

For some years Captain Smith has been exploring the regions named and studying collections made there by others, with the result of finding many new plants which are being described (and some handsomely figured) in this series of papers. Many of the descriptions are contributed by European specialists.

Contributions to the embryology of the Ranunculaceæ: DAVID M. MOTTIER.

This paper, which is richly illustrated by 59 figures, brings to our knowledge considerable variation in the development of the embryo sac in different genera of the family. One of the most striking points is in the announcement of the frequent occurrence in this family also of more than one embryo sac in the ovule and the presence of as many as five or more initial cells of embryo sacs in *Caltha*.

Observations on the development of Colletotrichum lindemuthianum in artificial cultures: GEO. F. ATKINSON.

This fungus is the one producing the common spot disease (anthracnose) of beans. Having made many failures in germinating the spores in artificial media, Professor Atkinson finally succeeded and gives a detailed account of his successful methods in this paper. Photomicrographs reproduced in half-tone show his results.

On the validity of some fossil species of Liriodendron: THEO. HOLM.

Mr. Holm criticises paleobotanists for naming scrappy remains of leaves, and takes to task especially Professor Hollick's determinations of some cretaceous plants from Long Island.

The nomenclature question: (1) *Botanical nomenclature and non-systematists:* W. F. GANONG; (2) *Dr. Robinson and homonyms:* FREDERICK V. COVILLE.

The nomenclature question is attracting a great deal of attention at present among botanists. In the first named contribution to the discussion Professor Ganong opposes the proposed reform, because it violates the psychological principles of the use of language, and because it is not likely to obtain a sufficient following to make its nomenclature intelligible. Mr. Coville points out the advantageous working of the law of the rejection of homonyms in a real case, as opposed to its disadvantageous working in the case supposed in a previous note by Dr. Robinson.

In *Briefer Articles* Mr. M. L. Fernald describes a new dandelion with red fruits (*Taraxacum erythrospermum* Andrz.) which has made its appearance in New England; an account is given of the Gilbreth botanical collection recently presented to Radcliffe College; Professor W. A. Kellerman reports an apparently authentic case of poisoning of children by eating shepherd's purse; Mr. C. L. Pollard describes a new variety of the arrow-leaved violet (*Viola sagittata Hicksii*) from the District of Columbia; and Dr. L. M. Underwood figures a curiously deformed Equisetum, presumably *E. hiemale*.

Under *Current Literature* are reviewed Oliver's 'Natural History of Plants,' a translation of Kerner's 'Pflanzenleben';

* Issued July 15, 1895. 56 pp., 3 pl.

Potter's translation of Warming's 'Handbook of Systematic Botany'; Darwin's 'Elements of Botany'; Lloyd's illustrations of fungi; MacDougal's 'Experimental Plant Physiology'; Bailey's 'Horticulturist's Rule Book'; Comstock's 'Manual for the Study of Insects'; and Dewey's last weed bulletin. In an *Open Letter* Professor Hollick replies on behalf of paleobotanists to Mr. Holmes' criticisms previously referred to. The number closes with four pages of *Notes and News*.

THE PSYCHOLOGICAL REVIEW, JULY.

The Psychology of Pain. By Professor C. A. Strong.

In this article the author reviews the evidence as to a sensation of pain, citing many pathological cases. He concludes in favor of pain as a sensation in addition to the unpleasantness which accompanies mental contents. He does not incline, however, to accept the view that sensation-pain has separate nerve fibres of its own.

Experimental Induction of Automatic Processes. By Professor W. R. Newbold.

A detailed experimental study of the visual images induced by steady gazing upon a shining surface, called 'crystal vision.' Many new and interesting experiences and variations are reported. The author takes occasion, on the strength of his experiments, to combat the theory of subconscious trains of ideas or 'secondary personalities' to account for these phenomena; holding that they can be explained as complex responses of the lower centres to stimulation.

Sensory Stimulation by Attention. By Professor J. G. Hibben.

Report of a case—a girl who could not hear except when her attention was directed to the source of the sound. The author discusses other cases of a similar kind and the possible grounds on which a reinforcement might come to the sensory processes from the processes of attention.

Shorter Contributions; Discussions: including a discussion on 'Shadows of Bloodvessels on the Retina,' by Mrs. C. Ladd Franklin; 'The New Psychology in Undergraduate Work,' by H. K. Wolfe, etc., followed by *Psychological Literature; Notes.*

PSYCHE, AUGUST.

W. T. Blatchley gives notes on 38 of the Heteroptera observed by him while winter collecting in Vigo County, Indiana. Dr. A. Davidson describes the habits of a Californian Stigmus, a wasp which stores its cells with aphides and notices two parasites bred from the larvæ, one of which is here described by Ashmead. C. H. T. Townsend describes the prickly leaf-gall of Rhodites tumidus on Rosa fendleri in New Mexico. D. W. Coquillett records the occurrence of Acreotrichus in Washington (State), a genus of Diptera heretofore known only from Australia, and describes the species. A. P. Morse describes three new species of North American Odonata of the genera Nehalennia and Enallagma; and Miss C. G. Soule prints some miscellaneous notes on moths. Brief proceedings of the Cambridge Entomological Club follow.

NEW BOOKS.

Elements of Botany. Francis Darwin. Cambridge, University Press. 1895. Pp. vii+235. $1.60.

The Science of Mechanics. Ernest Mach. Translated by Thomas J. McCormack. Chicago, Open Court Publishing Co. 1893. Pp. xiv+534.

Schneekrystalle. G. Hellman. Berlin, Rudolf Mückenberger. 1893. Pp. 66. M. 6.

Annual Report of the Geological Survey of Canada, Vol. VI. Ottawa. 1895. Pp.x+212.

Proceedings of the Iowa Academy of Sciences for 1894, Vol. II. Des Moines. 1895. Pp. 222.